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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 518,

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THE GREYHOUNDS OF THE ATLANTIC.

It is a question whether the new class of steamships of extreme speed and enormous size can be made as acceptable to their owners as to the public, for the large expense for first cost and maintenance makes it doubtful on which side the financial margin will be found. The managers of the Cunard Line seem, however, to have satisfied themselves of their profitableness, for within the past few years they have added to their fleet as many as five of the fastest and largest vessels afloat. The French Steamship Company are following the same policy, and the voyage from New York to Havre will be made next summer by the large new steamers recently built for the purpose. The other lines, however, are more conservative. The White Star Line has not added a new vessel to its fleet for years, and its steamers can no longer be called swift. The same thing holds true of the Inman Line. The America, of the National Line, and the City of Rome, of the Anchor, are both known as ocean racers. The Guion Line retains the Alaska and the Arizona, but was glad to sell the Oregon to the Cunard Company; and it is said that the rumor of war between England and Russia, which led to the chartering of this and other vessels, was hailed with delight by those companies whose property was taken. It will be observed that the evidence in the matter is decidedly ambiguous. While the one company is increasing size and speed, the others are holding back. The cost of operating these immense steamers is enormous, while the rates for ocean travel are, if anything, on the decline. The great size made necessary by high speeds adds to the resistance while it increases the power, and the greater space occupied by engines and coal bunkers does not permit a corresponding increase in the carrying capacity. The cost of a steamer like the Etruria is about $1,000,000; she burns over 300 tons of coal daily, and her crew is necessarily much larger than on a vessel of from five to six thousand tons burden.

She has carried as many as 600 first class passengers at one trip, and could this rate be maintained all the year round, she would, of course, be a very profitable investment; but the season of heavy travel is limited, and for a large part of the year she must either be laid up or run at a loss. The real question, then, as the *Tribune* puts it, is whether it will pay to build vessels at a vast cost which will run almost empty during half the year, and will make the passage from New York to Queenstown in twenty-fours less time than other vessels which cost much less and burn half as much coal. In the long run, it will probably be found that the most profitable steamers for transatlantic passenger service are boats like the Britannic, the Gallia, and the Normandie, which cross in about eight days. They burn something less than 200 tons of coal a day, and can accommodate about 300 passengers. The gain of the larger and swifter boats in capacity and speed is at too great a cost.

M. PASTEUR'S RESEARCHES IN THE TREATMENT OF HYDROPHOBIA.

The entire civilized world has for some time past been watching with intense interest the experiments on the treatment of hydrophobia conducted by the celebrated French scientist, Dr. Louis Pasteur. These researches have now been so far completed that the results have been presented by the investigator to the French Academy of Sciences. The first step in these investigations, as reported by cable to the *Herald*, was the inoculation of a rabbit with a fragment of tissue taken from the spine of a rabid dog. The incubation of the poison occupied fifteen days. As soon as the animal died, a portion of its spinal marrow was in turn inoculated into a second rabbit, and the process continued until sixty rabbits had been treated. Each inoculation increased the power of the virus, so that the last incubation occupied but seven days. As dried air diminishes the power of the virus, the spinal marrow of the inoculated rabbits was kept in bottles of dried air. In beginning his experiments, therefore, M. Pasteur inoculated his subject with the old tissue, and finished the operation by the injection of tissue that had been bottled only two days, the period of incubation of which would not exceed a week. These experiments have been very successful, for after such an inoculation the subject is found to be entirely proof against hydrophobia. An excellent opportunity to test the new treatment was afforded by a lad, twelve years old, named Meister, who had been bitten fourteen times by a rabid dog, and who was brought to M. Pasteur. As there seemed no doubt of a speedy and painful death, should nothing be done for the child, he was considered a proper subject for experiment. In thirteen days, the inoculations made upon the lad were gradually increased in strength, until the last was from a rabbit that had only died on the previous day. At the end of a hundred days, the lad was in perfect health, and the experiment was pronounced a decided success. Another lad, named Judith, who was fifteen years old, and had been bitten by a mad dog, was progressing satisfactorily after a week's treatment, and a fortnight from the time of the accident. To carry this system into effect, it will be necessary to have rabbit farms established, where the animals will be kept constantly inoculated with the disease, just as we now have bovine farms for the production of vaccine virus. Two lines of treatment are mentioned, the inoculation of human subjects and the blotting out of the disease by the compulsory inoculation of dogs for several generations. The origin and nature of hydrophobia are understood but imperfectly, and it is too soon to make any definite assertions in regard to M. Pasteur's system. It is probably but the first link in a chain of elaborate investigation. The honor, however, in such unique inquiries is to him who breaks the ground.

WAR BALLOONS.

At a recent meeting of the Military Service Institution, held at Governor's Island, Gen. Russell Thayer, of Philadelphia, presented in detail his system of independent and dependent dirigible balloons, intended particularly for use in war times. General Thayer has made many experiments in aerial navigation, and has so far been successful that a number of his designs and working models are now under consideration at the British War Office.

The independent balloon is for observation chiefly, and has sufficient carrying force to enable it to drop powerful explosive bombs upon the fleet or camp of an enemy, and cause greater destruction than the most formidable fortifications. The buoyant part of the balloon is made of superimposed tissues of silk or rubber, or vegetable textures impregnated with caoutchouc, to prevent the escape of hydrogen.

The form is that of a circular spindle, the longer horizontal axis of which should be three and two-thirds that of the smaller. The body is at all times perfectly inflated, so as to remain rigidly in shape. The suspended deck, carrying the machinery and crew, is firmly supported and braced. A lower deck carries the motive power. When the machinery is in operation, the balloon can be raised or lowered to any elevation without employment of ballast. Four cylinders located on the upper deck receive a portion of the hydrogen from the inflated bag of the balloon when it is desired to lessen its buoyancy, and consequently descend. To ascend, the gas is pumped from the cylinders into the bag, and by displacing the heavier air of the surrounding atmosphere, the buoyancy is increased.

The motor is a high pressure air compressor coupled directly to a newly devised carbonic acid gas engine and a reservoir for storing the air until sufficient pressure is obtained. At given intervals of time, the compressed air is suddenly released, producing a powerful forward thrust. As the carbonic acid gas engine uses no coal, danger from fire is entirely avoided. This is particularly important, since mixtures of hydrogen and air are so terribly explosive. The air being discharged at the stern through a pipe and nozzle fitted on a ball and socket joint, the direction of the air ship is determined by a wheel governing the movement of the pipe and nozzle. No other rudder is necessary. The efficiency of the mechanism is increased materially by placing hollow, truncated cones over the nozzle.

Gen. Thayer expressed his belief that air ships, even 1,000 yards in length, could be operated without difficulty, since the resistance does not increase in proportion to the size of the ship. Last year the United States Ordnance Board recommended the construction of an experimental balloon, 100 feet in diameter and 367 feet long. Such a ship would have a total ascending force of about 55 tons. It is thought that a speed of 50 miles an hour could be obtained. Gen. Thayer's model, being 30 feet long by 10 feet in diameter, was not placed on exhibition, as the assembly room was scarcely capacious enough.

The construction of the dependent dirigible balloon is similar to that of the independent ship except the motive power, which is here electricity. The track consists of two parallel wires supported on poles above the ground. The lower deck would be provided with two large wheels constructed to run on the under side of the wires, and two small wheels to run on the upper side. This arrangement anchors the balloon to the earth, and furnishes the motive current from a dynamo at the end of the line.

It is expected that a speed of at least 20 miles an hour could be obtained. A model of the balloon and track was shown, and by making the connection was operated successfully. These experiments have attracted much interest, and have inspired a confidence in their ultimate success when put into practice.

ACCORDING to *La Lumiere Electrique* Mr. L. Senet has invented a new process that permits of the manufacture of aluminum, as well as copper, silver, etc., by electrolysis. A current of from 6 to 7 volts and 4 amperes is made to act upon a saturated solution of sulphate of aluminum in the presence of a solution of chloride of sodium, the two solutions being separated by a porous vessel. A double chloride of aluminum and sodium is formed, which is decomposed, and the aluminum that is set free deposits upon the negative electrode.